



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/053,956	01/24/2002	Takayuki Matsushima	111719	4822
25944	7590	11/16/2004		
OLIFF & BERRIDGE, PLC P.O. BOX 19928 ALEXANDRIA, VA 22320				
			EXAMINER FEELY, MICHAEL J	
			ART UNIT 1712	PAPER NUMBER

DATE MAILED: 11/16/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/053,956

Applicant(s)

MATSUSHIMA, TAKAYUKI

Examiner

Michael J. Feely

Art Unit

1712

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 August 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 and 19-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 26 is/are allowed.
- 6) ☒ Claim(s) 1-15, 19, 21, 22, 24 and 25 is/are rejected.
- 7) ☒ Claim(s) 20 and 23 is/are objected to.
- 8) ☒ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 0604.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Pending Claims

Claims 1-15 and 19-26 are pending.

Previous Claim Rejections - 35 USC § 102

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
2. The rejection of claims 16 and 17 under 35 U.S.C. 102(e) as being anticipated by Murai et al. (US Pat. No. 6,437,090) has been rendered moot by the cancellation of claims 16 and 17.

Previous Claim Rejections - 35 USC § 103

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
4. The rejection of claims 1-15 and 19 under 35 U.S.C. 103(a) as being unpatentable over Tsutsumi et al. (US Pat. No. 6,361,879) and Harada et al. (US Pat. No. 6,555,602) stands.
5. The rejection of claim 20 under 35 U.S.C. 103(a) as being unpatentable over Tsutsumi et al. (US Pat. No. 6,361,879) and Harada et al. (US Pat. No. 6,555,602) has been overcome by amendment.

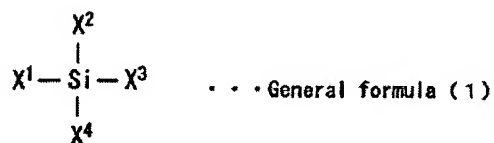
New Claim Rejections - 35 USC § 103

6. New claims 21, 22, 24, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsutsumi et al. (US Pat. No. 6,361,879) in view of Harada et al. (US Pat. No. 6,555,602).

Regarding claims 1, 4, 5, 9-14, 19, and 21, Tsutsumi et al. disclose: *(1)* an adhesive (Abstract) comprising a resin component (column 3, lines 17-36), a metal chelate (column 4, lines 17-46), and a silane coupling agent (column 4, lines 47-56), wherein said resin component

Art Unit: 1712

includes a thermosetting resin (column 3, lines 17-36) and a silane coupling agent is composed of a silane compound represented by general formula (1):



wherein at least one substituent X^1 through X^4 is an alkoxy group, and wherein if one or more of the substituents X^1 through X^4 is a substituent other than the alkoxy group, such substituent other than alkoxy group is a substituent that includes in its structure a functional group selected from the group consisting of epoxy ring, vinyl group, amino group, mercapto group, and methyl group (column 4, lines 47-56); and *wherein the adhesive is in the form of a paste (column 5, lines 7-14).*

(4) wherein at least one of the substituents X^1 through X^4 of said silane compound is a substituent other than alkoxy and at least one of said substituents other than alkoxy has an epoxy ring (column 4, lines 47-56);

(5) wherein at least one of the substituents X^1 through X^4 of said silane compound is a substituent other than alkoxy and at least one of said substituents other than alkoxy has a vinyl group (column 4, lines 47-56);

(9 & 10) wherein said resin component includes a thermoplastic resin and an amount of said thermoplastic resin is 10 parts by weight or more with respect to 100 parts by weight of said thermosetting resin (column 4, lines 10-17);

(11) wherein said thermosetting resin is an epoxy resin (column 3, lines 17-36); (12) wherein the epoxy resin is an alicyclic epoxy resin (column 3, line 24);

(13 & 14) wherein said metal chelate includes aluminum chelate as a major component;

Art Unit: 1712

(19) wherein the metal chelate is a powder or liquid (column 4, lines 17-46); and

(21) wherein the metal chelate is a solid (column 4, lines 30-33).

Tsutsumi et al. teach the use of metal chelate curing catalyst (column 4, lines 17-46), including tri(acetylacetonato)aluminum; however, they fail to teach (1) the microencapsulation of this metal chelate catalyst, (20) wherein the microcapsules are formed as an absorbent resin particles dispersed in the adhesive.

Harada et al. disclose an epoxy composition that is analogous to the composition of Tsutsumi et al., wherein both compositions are used for semiconductor encapsulation. The following is a side-by-side comparison of the two compositions:

Tsutsumi et al. (US Pat. No. 6,361,879)	Harada et al. (US Pat. No. 6,555,602)
(A) Epoxy resin (column 3, lines 17-36)	(A) Epoxy resin (column 4, line 15 through column 5, line 63)
(B) Curing agent (including anhydride) (column 3, lines 37-58)	(B) Anhydride curing agent (column 5, line 64 through column 6, line 27)
(C) Filler (column 3, line 59 through column 4, line 2)	(D) Filler (column 11, lines 22-47)
(D) Optional elastomer or thermoplastic (column 4, lines 3-17)	
Curing catalyst, including metal chelates (column 4, lines 17-46)	(C) Core-shell microencapsulated curing catalyst (liquid or solid) (column 6, line 27 through column 7, line 34)
Silane coupling agent (column 4, lines 47-56)	Silane coupling agent (column 11, lines 52-63)
Optional additives, such as flame retardants (column 4, lines 57-65)	Optional additives, such as flame retardants (column 11, line 64 through column 12, line 60)

The above table demonstrates that the references are analogous art. The one distinct difference is that Harada et al. teach the use of a core-shell microencapsulated curing catalyst, wherein the catalyst core is coated with a polymeric shell material; however, they fail to explicitly teach the use of a metal chelate catalyst core. The catalyst requirement of Harada et al. is, "the cure accelerator to be (micro)encapsulated as a core portion in the foregoing microcapsule type curing accelerator is not specifically limited *so far as it acts to accelerate curing reaction*," (column 6, lines 56-59), wherein the advantage of using this core-shell microencapsulated catalyst is that, "the resin composition for semiconductor encapsulation comprising such a microcapsule type cure accelerator incorporated therein exhibits extremely prolonged pot life and thus is excellent particularly in storage stability," (column 6, lines 40-44).

In light of this, Tsutsumi et al. demonstrate that metal chelates, including tri(acetylacetonato)aluminum, are suitable materials *to accelerate (the) curing reaction* of this particular resin system; hence, these chelates would qualify as a suitable core catalyst material for the microencapsulated catalyst taught by Harada et al. One skilled in the art would have been motivated to use such a microencapsulated catalyst in the composition of Tsutsumi et al. in order to extend pot life and storage stability.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a microencapsulated metal chelate (including an aluminum chelate) catalyst formed as absorbent resin particles and dispersed in the adhesive, as suggested in Harada et al., in the epoxy composition of Tsutsumi et al. because Harada et al. teach an epoxy resin composition for semiconductor encapsulation that is analogous to the one taught by Tsutsumi et

Art Unit: 1712

al., wherein the curing catalyst is a core-shell microcapsule featuring as polymeric shell and a catalyst core that is not limited so far as it acts to accelerate the curing reaction of the epoxy composition, resulting in prolonged pot life and excellent storage stability.

Regarding claims 2, 3, 6, and 7, Tsutsumi et al. disclose, "preferably, the silane coupling agent for use herein has an alkoxy group and "a hydrocarbon group with a functional group of, for example, epoxy group, amino group, mercapto group or the like bonding thereto" both bonding to the silicon atoms constituting it," (column 4, lines 52-56); however, they do not explicitly disclose that: (2) said alkoxy group is a methoxy group; (3) said alkoxy group is an ethoxy group; (6) said substituent having the epoxy ring is a γ -glycidoxypopyl group

represented by chemical formula (2) $\text{CH}_2 = \text{CH} - \text{CH}_2 - \text{O} - \text{C}_3\text{H}_6 - \dots$ Chemical formula (2) ; and (7) said substituent having the vinyl group is a γ -methacryloxypopyl group represented by chemical

formula (3) $\text{CH}_2 = \text{C}(\text{CH}_3) - \text{C}(\text{O}) - \text{O} - \text{C}_3\text{H}_6 - \dots$ Chemical formula (3)

As set forth above, Harada et al. disclose an epoxy composition that is analogous to the epoxy composition of Tsutsumi et al. Harada et al. disclose, "examples of the silane coupling agent employable herein include γ -mercaptopropyl trimethoxysilane, *γ -glycidoxypopyl methyl diethoxysilane*, β -(3,4-epoxycyclohexyl)ethyltrimethoxysilane, *γ -methacryloxypopyl trimethoxysilane*, and amino group-containing silane," (column 11, lines 57-62). Because the two prior art composition are analogous, Harada et al. demonstrates that: methoxy and ethoxy are suitable alkoxy groups; γ -glycidoxypopyl is a suitable epoxy functional group, and γ -

Art Unit: 1712

methacryloxypropyl is a suitable vinyl functional group for the silane coupling agent used in Tsutsumi et al.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a silane coupling agent featuring: methoxy or ethoxy groups, γ -glycidoxypropyl, and γ -methacryloxypropyl, as taught by Harada et al., in epoxy composition of Tsutsumi et al. because Harada et al. teach an epoxy resin composition for semiconductor encapsulation that is analogous to the one taught by Tsutsumi et al., wherein the silane coupling agent is selected from a group including γ -glycidoxypropyl methyl diethoxysilane, and γ -methacryloxypropyl trimethoxysilane, resulting in improved adhesion.

Regarding claim 8, Tsutsumi et al. disclose the adhesive composition according to claim 1, wherein an amount of the metal chelate is from 0.1 parts by weight to 20 parts by weight with respect to 100 parts by weight of said resin component (column 4, lines 43-46); however, both Tsutsumi et al. and Harada et al. are silent regarding the amount of silane coupling agent being from 0.1 to 35 parts by weight with respect to 100 parts by weight of the resin component.

Applicant fails to show criticality for this range, and one skilled in the art would recognize that the concentration of a coupling agent is a result effective variable. A coupling agent is added to enhance adhesion properties of a composition, wherein a very low quantity would not provide a noticeable effect on the adhesion properties, and a very high quantity would jeopardize the integrity and processability of the composition. Furthermore, it has been found that, "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover optimum or workable ranges by routine experimentation – *In re Aller*, 220 F.2d 454,

456, 105 USPQ 233, 235 (CCPA 1955) and *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use 0.1 to 35 parts by weight of silane coupling agent based on 100 parts by weight of epoxy resin in the composition based on the combined teachings of Tsutsumi et al. and Harada et al. because applicant fails to show critically for this range, and the optimization of a result effective variable is not an inventive concept.

Regarding claims 15 and 24, the combined teachings of Tsutsumi et al. and Harada et al. are as set forth above and incorporated herein to satisfy the limitations of claims 15 and 24 – *see claim 1 analysis*. It should be noted that the catalyst would have been inherently dispersed in the adhesive film given the employable methods taught in Tsutsumi et al. (*see column 5, lines 7-14*).

Regarding claim 22, Tsutsumi et al. disclose, “The resin composition of the invention may have a viscosity of 0.1 to 1500 Pa*S, but preferably 0.5 to 40 Pa*S, more preferably 1 to 10 Pa*S at a temperature at which the composition is sealed on a chip wafer in the step of sealing semiconductor chips with it. The range of the viscosity of the composition is preferred so as to efficiently and uniformly form a good seal with no defect of the resin on the entire surface of a chip wafer. The resin composition of the invention is applied onto a wafer having semiconductor chips thereon, thereby sealing the entire surface of the chip wafer. The method of sealing a chip wafer is not specifically defined. Employable methods include *potting*, spin coating, *screen printing*, transfer molding or the like,” (column 4, line 66 through column 5, line 12). However, they do not explicitly disclose (22) that a solvent is used to adjust the viscosity.

The teachings of Tsutsumi et al. and Harada et al. are as set forth above and incorporated herein. Furthermore, Harada et al. disclose, "In order to adjust the fluidity of the resin composition for semiconductor encapsulation, an organic solvent may be added," (column 13, lines 1-3).

Therefore, it would have been obvious to add an organic solvent, as taught by Harada et al., in the composition of Tsutsumi et al. because Harada et al. disclose the addition of an organic solvent, resulting in improved fluidity of the resin composition.

Regarding claim 25, the combined teachings of Tsutsumi et al. and Harada et al. are as set forth above and incorporated herein to satisfy the limitations of claim 25 – *see claim 8 analysis*.

Allowable Subject Matter

7. Claims 20 and 23 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. Claim 26 is allowed.

9. The following is a statement of reasons for the indication of allowable subject matter:

Regarding claims 20 and 23, the prior art fails to teach or suggest the use of a liquid metal chelate in the composition of claim 1/the film of claim 15. Tsutsumi et al. only use solid metal chelates.

Regarding claim 26, the prior art fails to teach or suggest the use of an encapsulated silane coupling agent, in combination with a thermosetting resin and a metal chelate.

Response to Arguments

10. Applicant's arguments filed August 24, 2004 have been fully considered but they are not persuasive. Applicants have set forth the following arguments:

A1: The adhesive of Tsutsumi et al. is a solid, not a paste – *see pages 8 and 9*.

A2: Tsutsumi et al. does not require the presence of both the curing catalyst and the silane coupling agent, and there would be little motivation to select a metal chelate from the cited list – *see pages 9 and 10*.

B1: (no additional arguments) – *see page 10*.

C1: Tsutsumi et al. do not disclose the quantity of the silane coupling agent being from 0.1 to 35 pbw (per 100 pbw of resin) – *see page 10*.

C2: Tsutsumi et al. and Harada et al. cure by anionic polymerization, while the instant invention cures by cationic polymerization (reaction of the metal chelate and the silane coupling agent). Accordingly, the amount of silane would not be analogous – *see page 11*.

D1: The films of Tsutsumi et al. and Harada et al. are post-cured, while the film of the instant invention is not cured – *see pages 11 and 12*.

D2: Tsutsumi et al. does not require the presence of both the curing catalyst and the silane coupling agent – *see page 12*.

E1: (no additional arguments) – *see page 13*.

Response to Argument A1:

The resin composition of Tsutsumi et al. is not limited to a solid; rather, they disclose, “The resin composition of the invention is applied onto a wafer having semiconductor chips thereon, thereby sealing the entire surface of the chip wafer. The method of sealing a chip wafer

is not specifically defined. Employable methods include *potting*, spin coating, *screen printing*, transfer molding or the like,” (column 5, lines 6-12). One skilled in the art would appreciate that *potting* and *screen printing* methods employ resin pastes. Furthermore, the composition of Harada et al. is also employed as a paste (*see column 12, line 61 through column 13, line 64*). Hence, the argument is not persuasive.

Response to Argument A2:

Applicant is reminded that a reference is considered for all that it teaches – not just the preferred embodiments – *see MPEP 2123*. The silane coupling agent and catalysts are optional components; however, they are not described in terms of alternatives (one or the other). Based on the discussion of individual components (*see column 4, lines 18-55*), it would have been reasonable to expect one skilled in the art to use both a catalyst and as silane coupling agent.

Furthermore, Tsutsumi et al. disclose four specific categories of catalysts, including organic metal compounds. Specifically cited in this category were: tetrakis(acetylacetonato)zirconium and tri(acetylacetonato)aluminum. Considering the size of this list, it would have reasonable to expect one skilled in the art to select a metal chelate. Hence, the argument is not persuasive.

Response to Argument C1:

It has been established that the quantity of a silane *coupling* agent is a result effective variable, and Applicants have failed to demonstrate criticality for their range. Hence, the argument is not persuasive.

Response to Argument C2:

The ionic mechanism discussed by Applicants is not set forth in the claim limitations. Furthermore, it should be noted that the instant claims are written with open transitional language. Although the instant invention may be different from the one set forth in the prior art, the claim language of the instant claims falls short of establishing these differences. In light of this, Tsutsumi et al. and Harada et al. have been established as analogues, providing motivation to combine their teachings. Hence, the argument is not persuasive.

Response to Argument D1:

Due to the nature of adhesive materials, Applicants have essentially admitted that they are claiming an intermediate material (uncured). In light of the employable methods set forth above in the response to A1, such an intermediate material would have been inherently taught by the cited prior art. Hence, the argument is not persuasive.

Response to Argument D2:

Applicant is reminded that a reference is considered for all that it teaches – not just the preferred embodiments – *see MPEP 2123*. The silane coupling agent and catalysts are optional components; however, they are not described in terms of alternatives (one or the other). Based on the discussion of individual components (*see column 4, lines 18-55*), it would have been reasonable to expect one skilled in the art to use both a catalyst and as silane coupling agent.

Furthermore, Tsutsumi et al. disclose four specific categories of catalysts, including organic metal compounds. Specifically cited in this category were: tetrakis(acetylacetonato)zirconium and tri(acetylacetonato)aluminum. Considering the size of this list, it would have reasonable to expect one skilled in the art to select a metal chelate. Hence, the argument is not persuasive.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Communication

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael J. Feely whose telephone number is 571-272-1086. The examiner can normally be reached on M-F 8:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski can be reached on 571-272-1302. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Michael J. Feely
Patent Examiner
Art Unit 1712

November 15, 2004